The Comparison of Hybrid Impact Sets Computed During the Application in Different Areas

Ferenc Fischer

The impact analysis is an important topic in software engineering, due to the continuous changing of software. The impact set [1] is a dependency set which contains the impacting and/or the impacted program elements for a set of program elements. The impact set of changing can be used in several parts of the software lifecycle, for example to estimate the costs of software changing or to help programmers to find program artifacts, - which may have been affected by the changing - or to seek for occurred bugs (debugging). These tasks demand various impact sets in terms of size, safeness and cost. We defined and calculated various impact sets (hybrid impact sets) by combination and limitation of the static and the dynamic impact sets. Static impact sets are calculated by the analysis of the source code without executing of the program. Dynamic impact sets are dependencies occurring during program runs on inputs.

To determine the dynamic impact set we created execution trace and computed DFC (Dynamic Function Coupling [2]) relation between methods. During calculating the static impact set we statically analyzed the source code and built a representation of the code to retrieve SEASEB (union of Static Execute After and Static Execute Before [3]) relation.

We define different strategies to compute these impact sets based on the distance between methods. This distance can be used for changing the size, the safeness and the costs of combined impact sets by distance limitation and/or by subtype limitation (call, return, sequential relation). Based on Reliability Growth Modelling we can reduce the computation cost of the dynamic impact set by running only selected test cases.

We have computed these impact sets for several Java programs to characterize these sets. A selection strategy is given by us to choose the most suitable method and the most appropriate impact set for the necessary tasks, goals and for the available resources. This comparison of the hybrid impact sets based on DFC and SEASEB is unique and the selection strategy can help the programmers to choose the best hybrid impact set for their tasks and resources.

References

[1] V. Rajlich and P. Gosavi. Incremental change in objectoriented programming, *IEEE Software*, 21(4):62-69, 2004.

[2] Árpád Beszédes and Tamás Gergely and Szabolcs Faragó and Tibor Gyimóthy and Ferenc Fischer. The Dynamic Function Coupling Metric and Its Use in Software Evolution, *Proceedings of 11th European Conference on Software Maintenance and Reengineering (CSMR'2007)*, pages 103-112, 2007.

[3] Jász, Judit and Beszédes, Árpád and Gyimóthy, Tibor and Rajlich, Václav. Static Execute After/Before as a Replacement of Traditional Software Dependencies, *Proceedings of the 2008 IEEE International Conference on Software Maintenance (ICSM'08)*, pages 137-146, 2008.